Nutrition for healthy claws

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NUTRITION FOR HEALTHY CLAWS

A RESEARCH PROJECT CONDUCTED AT THE TIERGARTEN IN NUREMBERG DISCOVERED THAT DIET CAN IMPROVE CLAW HEALTH IN TAKINS

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In zoos, the feeding of rare and exotic herbivores often represents a challenge. This is also true for zoos that keep takins. The takin (*Budorcas taxicolor taxicolor*), which belongs to the sub-family of goat-antelopes (*Caprinae*), is native to India, Myanmar and the People's Republic of China and lives at altitudes between 1,000 and 4,500m above sea level. Takins are mainly browsers, although they also consume fresh herbs and grass when seasonally available (Schaller *et al*., 1986).

The takin herd in the Tiergarten Nuremberg experienced problems with claw health. Claw growth was excessive and, over time, the claw horns cracked and fissures appeared. These changes were mainly observed in the bull, but other individuals in the herd were affected, too. Regular hoof trims under full anaesthesia were necessary for animal health and welfare reasons. The bull and some females were recently moved to Nuremberg from another zoo, where these problems did not occur. The head veterinarian therefore requested the help of the nutritional consultation service of the Institute of Animal Nutrition, Vetsuisse Faculty, University of Zurich, to determine whether nutrition could be one of the reasons for poor claw health and excessive claw growth in their takins.

Reasons for reduced claw health in ruminants are numerous, and it is often a multifactorial disease. In the literature, diets with high starch or high sugar contents increase the risk of lameness via ruminal acidosis (Lean *et al*., 2013). This problem is exacerbated when not enough roughage or browse are offered. Also, high-protein diets are implicated in inducing lameness in cattle (Westwood *et al*., 2003). Regarding other dietary components, deficiencies in minerals such as calcium, phosphorus, selenium, copper and zinc negatively impact claw health in dairy herds (Lean *et al*., 2013). Vitamin D deficiency also could play a role in the pathogenesis of claw problems (Lean *et al*., 2013).

In the Tiergarten Nuremberg, the takins are kept in an enclosure with different substrates. A large part of the enclosure is earth or grass paddock, with a small concrete area where the feeding takes place. The daily ration in summer consists of fresh grass, second-cut hay, carrots, beetroot, wheat bran, oats, pellets, vitamin and mineral supplements; crisp bread is also given, but only for training. In addition, the animals are offered fresh branches on a daily basis and have access to multiple salt licks. The whole group is fed together, so methods for intake reconstruction of the individual animal are needed. There are mainly two methods used. In method 1, the total weight of the group is calculated and the amount of the feed materials is divided by the total weight of the group and then multiplied with the weight of the bull (Table 1). In method 2, the weights are calculated with metabolic bodyweight (body weight0.85). That means the metabolic body weight of each individual animal has to be added to receive the total group metabolic body weight. The amount of the feed materials is then divided by the total metabolic body weight of the group and finally multiplied with

Table 1: Example of intake reconstruction using method 1 with body weight (BW)

Food item	Group intake [g/day]	Total group weight [kg]	Intake [g/kg BW/day]	Individual intake bull 255kg BW [g/day]
Grass	38000	1445	26.3	6706
Hay	7000		4.8	1235
Beetroot	5000		3.5	882

Table 2: Example of intake reconstruction using method 2 with metabolic body weight (BW0.85)

Food item	Group intake [g/day]	Total group BW0.85 [kg]	Intake [g/kg BW0.85/day]	Individual intake bull 111.1kg BW0.85 [g/day]
Grass	38000	660.3	57.5	6391
Hay	7000		10.6	1177
Beetroot	5000		7.6	841

Table 3: Metabolisable energy (ME), crude protein (CP), acid detergent fibre (ADF), neutral detergent fibre (NDF), iron (Fe), copper (Cu), zinc (Zn) and selenium (Se) content of diet per day calculated with different reconstruction methods (RM) and compared to recommended diet and nutrient recommendations.

	ME [MJ]	CP [g]	ADF [g]	NDF [g]	Sugar [g]	Fe [mg]	Cu [mg]	Zn [mg]	Se [mg]
Diet RM 1	42.4	661	651	1530	807	125.1	9.1	60.3	0.2
Diet RM 2	39.8	633	623	1104	771	119.7	8.7	56.7	0.2
Recommendations (NRC[1] or Supplemente[2])	31	260				380	30	76.5	0.32
Recommended diet	32.6	435	945	1530	273	402	31	206	0.8

the metabolic body weight of the bull (Table 2).

Depending on the method of intake reconstruction (method 1 or method 2), the bull with an approximate body weight of 255kg had an estimated daily energy intake between 42.1 and 39.8 MJ metabolisable energy (ME) respectively, which is markedly higher than recommendations for a hypothetical 255kg goat ram according to the NRC 2007 (31 MJ ME/day). Also, crude protein intake was high and trace elements (iron, zinc, copper and selenium) were low compared to goat and sheep requirements. Vitamin D intake was calculated to be adequate for the takin bull. Regarding fibre, the structure of the individual feedstuff seemed too low. Also, neutral detergent fibre (NDF) and acid detergent fibre (ADF) were relatively low and sugar was relatively high compared to the recommendations for goats (Table 3).

Recommendations were made to reduce the energy and highly fermentable carbohydrate content (starch and sugar) of the daily ration. Also mineral supplementation was augmented to cover the requirements suggested for a hypothetical 255kg goat ram. The recommendation for the herd was as follows: grass, a late first cut of hay, lucerne hay, whole plant corn pellets, wheat bran, carrots, mineral supplement, a selenium supplement and crisp bread for training. Branches should continue to be offered in high quantities, such as hazel or linden, to provide the takins with sufficient browse. Also, enough easily accessible salt licks should be provided.

After the nutritional changes were implemented, an improvement of claw health in the bull and the two highest ranking females was observed. Prior to the changes, claw growth was excessive and the claws had to be clipped often. After the diet change, no additional clipping has been necessary to date.

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